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[Douglas, F. D.]

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The Philosophy

OF

Butter Making.

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THE PHILOSOPHY OF BUTTER MAKING.

By Hon. F. D. Douglass, of Vt.

Mr. Chairman, Ladies and Gentlemen:

So much has been said and written of late upon the subject of butter making, and it is a subject so common-place and prosy in itself, that I can hardly expect to interest you by the presentation of any new and impressive facts with regard to it. But facts will bear repetition; and if to listen to their repetition is tiresome, at least it has in its favor this redeeming feature: it will not be attended with any serious evil effects. It is very possible, however, that I may take some erroneous positions, and if so, I trust you will freely point them out, and expose my errors. Absolute truth should be the object sought in all our investigations.

Success in butter making is dependent upon the observance of certain natural laws and conditions. These are uniform in their operation, and unchangeable in their character. Their application will produce the same results at all times and in all localities. If we establish the truth of a principle in natural science to-day, we may safely adopt it into our practice for all time to come; the only doubt which we can reasonably entertain being with regard to the accuracy of our demonstration of it.

The first duty of the dairyman, therefore, should be to thoroughly understand these; to be able to trace intelligently the relation between cause and effect, and so control and arrange the conditions that the desired results may follow. We should understand the reason of things which apply to our calling, as well as the lawyer, the doctor, or other members of the so-called learned professions. Our failures usually result from a want of a clear perception of the objects to be attained, and of intelligent systematic efforts in their pursuit.

To be systematic in the development of our business, is to uniformly so apply our forces, that we may best secure the aid of natural laws. A perfect system of practice can only result from a perfect understanding of these. The degree of

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our success in butter making is dependent upon the perfection of our system and the diligence with which we apply it in our practice. Every detail of our process should be carefully considered, that an intelligent reason may be given for every step in the methods which we adopt.

SYSTEM.

A well founded system is a permanent acquisition to the butter maker. When by the repeated application of thorough tests the practicability of its various details have once been demonstrated, we should confidently adopt and practice them, that by uniformity of action we may secure uniformity of results. We should never adopt rules or modes because of the antiquity of their origin, or reject them because of their recent date, but always where doubt occurs apply those practical tests which are the only safe guide to valuable systems of practice. I do not expect at this time to present a perfect system for butter making, for I do not claim to have reached perfection in this art; but only to present some of the most important features of what I believe to be a rational practice, and my reasons for their adoption.

THE COW.

No system of butter making is complete which does not provide for a good supply of healthy pure milk, and that of the right quality for the purpose.

The first, and perhaps most important, condition of success, is the proper selection of cows. Some cows are supplied with an organism which peculiarly adapts them to the purpose of butter making; while others are nearly worthless for this purpose. Between these two extremes we find a wide range of excellence. No butter maker can afford to neglect a thorough test of the individual qualities of the individual members of his herd. The true butter-producing cow gives milk rich in cream, with a small proportion of casein. The best cows for cheese-making purposes give milk of opposite characteristics.

For butter, the cream should be thick and firm in appearance, and readily become of a yellowish tint when exposed to light. In rising, it should bring with it but a small amount of casein, and should readily part with this when agitated. A cow giving milk of this quality cannot be expected to yield a large amount in bulk. The quantity of milk which a cow gives is a poor criterion by which to judge of her value for a butter dairy. For cheese making, or for ordinary family use, it is very desirable that the flow should be large and rich in casein, with less cream. Perfection for both the cheese and butter dairy cannot be combined in the same animal. An exorbitant production of cream must be attended with a diminished proportion of casein and *vice versa.* If it were not so, the animal organism would suffer from over production. The undue strain upon the animal functions would result in their ruin. Reason, then, would dictate the selection of such cows as secrete the largest amount of butter globules, of the best quality, from a given amount and quality of food. No cow is possessed of digestive organs which will elaborate butter globules from food which contains few or none of their constituents. As a rule, her yield of these will be in proportion to the available amount of the necessary elements which her food contains.

Food.

We can, undoubtedly, supply her with these most cheaply, and successfully, by the use of the best natural grasses. She should have a variety of such, and when they fail, she should be supplied with food which most nearly resembles these in its constituents. Early cut and well cured hay, with the addition of a few roots, and shorts, or corn meal, furnish an excellent substitute. Sowed corn, which has reached a good degree of maturity, is also excellent food from which to extract butter; while a rapid, dense growth, of large slowly maturing varieties, is nearly worthless for this purpose. All food, possessing a pungent, rank odor, or a disagreeable flavor, should be studiously kept from her. The feeding of sour milk, or slops of any kind, should not be practiced. A cow fed upon swill food, will give swill milk in return.

Pure Air.

Foul air, also, inhaled into the system, will taint the milk and butter, which she produces. The presence of a few bushels of onions, in the barn where she is kept, will also have the same effect. Her stable should be well ventilated, and its proximity to pig-stys, sewers, or heaps of fermenting manure, should be avoided.

PURE WATER.

She should be supplied with pure water, as impure water is ruinous, not only indirectly, by its effect upon the health of our cows, but directly through their milk secreting organs. It is useless to attempt the production of good butter from the best of cows, when supplied with the best of food, if they are compelled to quench their thirst from some foul and stagnant pool. Such water, besides its foul putrefactions, often swarms with microscopic life, which rapidly multiplies, both in the blood of the cow, and in her product, and blights all hope of success.

HEALTH.

Perfect health must be maintained, and all excitable conditions, from whatever cause, should be avoided, as these conditions undoubtedly affect the structure of the milk. A feverish, nervous, unhealthy cow, is worthless for a butter dairy. The pastures should be supplied with shade trees, to protect the cow from the scorching heats of summer, which tend to induce a feverish state; while her winter quarters should be warm, and so located and constructed that she may receive the greatest possible benefit from the winter's sun. A cow, constantly confined in a dark damp cellar, like the criminal in a dungeon, will lose her health and vitality, and if organic disease is not induced, by such treatment, she will at least be unfitted for the production of healthy milk.

MILKING, AND CARE OF MILK.

Cows should be milked regularly, and by the same individual, and great care taken to avoid all irritation, or excitement during the operation. No cow will yield a full flow of milk when excited. She should, by gentle treatment, become attached to the one who milks her, and maintain that contented, composed condition, which she naturally assumes while suckling her young. The milk should be strained through a fine cloth, that all particles of dust, which may have fallen into it, may be effectually removed. With the poor conveniences which most dairy farms afford, and the indifferent help which must often from necessity be employed, this precaution is very essential. In my own practice, I use a pail, with a large metallic strainer attached, and also a fine cloth strainer, so arranged as to present a large surface, and promote a ready flow. The use of the first is attended with little trouble, and the advantage derived from the use of the second, is very apparent, even with well kept yards, and stables, and a good degree of care. No wooden vessels should be used for the handling, or storing, of milk or cream. Well tinned vessels are much less liable to present crevices for the deposit of the germs of putrefaction. By the practice of a system of production, like that which I have pointed out, our milk will be brought to the dairy-room, rich in butter, sweet, healthy, and pure. Without such milk, the best systems for manufacture will fail of good results; and the efforts of the most skillful dairy-maid cannot produce a perfect article.

DAIRY ROOM.

The dairy room should be situated in a dry, airy location, and protected on the south from the heat of the sun. It should be well ventilated, and supplied with window-shutters, by which the amount of light and air in the room may be easily controlled. It should be so constructed, that it can be made warm in winter, and cool in summer. A damp, cellar-like, unwholesome atmosphere, should be guarded against, and for this reason, underground rooms, or those constructed of stone, are not desirable for cream raising purposes. The importance of perfect cleanliness in all the details of butter-making, is so well understood by all, that perhaps it is unnecessary to say, that the milk-room should not be located near any of the sources of impure air which are found upon the farm. No heaps of old rubbish should be tolerated near it. No unnecessary pouring or slopping of milk allowed within. No utensils, or articles of merchandise, not used for the purposes to which the room is devoted, should be allowed a lodgment upon its shelves. No air-polluting, fly-attracting receptacle, for sour milk or slops, should be found near it. Its well painted floor and ceiling, its snowy white-washed walls, its tidy appearance and well kept surroundings, should give it an air of neatness and purity which would not disgrace a lady's parlor.

MANUFACTURE.

The object sought in the manufacture of butter, is the separation of the butter globules from the casein and other ingredients of the milk, their retention in a pure state, and their proper preparation for use, by the addition of the necessary amount of salt. This separation commences in the process of cream-raising, and it is highly important that we adopt a method by which, in this stage of the process, it should be as complete as possible. The conditions of success are a right and uniform temperature, rest, protection from taints and evaporation, from the destructive influences of the atmosphere, and to intense light. That method should be adopted, which, with the least expenditure of labor, will secure these conditions.

SYSTEMS IN COMMON USE.

I propose to speak briefly of some of the modes employed, and point out their advantages, and defects. The first to which I shall allude, is that time-honored practice of setting milk in flaring shallow pans. By this irrational practice, that most fickle, changeable medium, atmospheric air, is adopted for the preservation of a uniform temperature. If the temperature of the milk could be as readily changed as is that of the medium employed, we should have a result, in this respect, no more uniform than that synonym of perfect instability, the wind. That old saying, "as changeable as the wind," would fitly represent the thermometrical condition of the milk. But fortunately, fluids stubbornly refuse to change their temperature as quickly as the air, and consequently we get, by this method, a slightly more uniform temperature than in the medium which we employ. The adoption of such a medium for the preservation of a uniform temperature, of whatever degree, in a climate like ours, is inconsistent in theory, and ruinous in practice, especially in hot or cold weather. We must necessarily expose a large surface of our milk to this medium, and in so doing we violate all but two of the conditions named, which are—rest, and exposure to light. Common sense, as well as experience, teaches the prudent housewife that those jellies, canned fruits, and sweet-meats, which she wishes to preserve from decomposition, should not be spread out to the destructive influences of the atmosphere; and why should she thus expose her cream, the most delicate of all the substances in her possession? Cream, also, should be kept in its naturally fluid state to ensure a perfect separation in churning. Dried particles will not separate as easily as fluid cream, and will remain in the form of white specks in the butter produced from the mixture. Why expose it to a ruinous, drying process in shallow flaring pans, so constructed that the cream, on the wedged shaped edge of the upper surface is sure to become attached to the sides, as the mass shrinks by evaporation, and there becomes hardened, and ensures a result in a drying atmosphere, which all butter-makers and butter-eaters deprecate.

The practice, too, is unnecessarily laborious and unpleasant. The straining, the placing of the pans when filled upon the shelves, their return to the table to be skimmed, the pouring of the milk into pails, the washing, scalding, and drying, of the large number of pans required, the slopping, spattering, and filth, which unavoidably attends this process and greatly increases the labor required in the care of the dairy-room, all tend to make the business slavish, disagreeable, and unprofitable, and also give evidence of the truth of my statement, that the method is an irrational one.

PATENT PANS.

The Patent Pan system is much better every way than the old method. The use of water as a medium for regulating the temperature; the concentration of the milk into larger deeper masses, and consequently better protection afforded it; the less amount of surface to be skimmed; the improved facilities for straining and disposing of the milk when the cream is removed; the greatly diminished amount of labor required in the room, all point to this as a progressive step in the art of butter-making. But this system has its defects, and though its invention indicates progress in the right direction, it is yet imperfect. By its practice important natural laws are violated, and the attainment of certain essential conditions defeated.

Uniformity of temperature throughout the entire mass of milk cannot ordinarily be secured by it. There is a natural principle involved in this which we all understand, but the importance, and influence of which, those who have not practically investigated the matter, fail to appreciate. It is that natural law which causes heat to rise, and which renders it almost impossible to draw it downward through liquids. If I apply ice-water to the bottom of a vat of milk, the temperature at that point will nearly correspond with that of the water, while at the surface, unless very shallow, it will be found to nearly correspond with that of the surrounding atmosphere. The extent of this influence can best be understood by practical demonstrations of its effects. I have found in my practice, that when several pails of freshly drawn milk have been placed in vats of water, nine or ten inches deep, the animal heat of the milk, and an atmosphere of 80° or 85° in temperature, would thus cause a variation of 20° to 25° between the water at the surface and that at the bottom of the vat, even when ice was floating upon the surface. That when the influence of the animal heat has passed, the variation usually ranges from 9° to 15° with the temperature of the room, and depth of the water as stated above. If the ice had been applied at the bottom, as with some of the patent pans in use, the variation of course would have been much greater. Heat can be drawn laterally, through fluids, much more readily than downwards; but its influence upon a vat of milk will reach but a short distance in this direction. In large pans of considerable width, with cold water applied at the bottom and sides, the milk will be found to sour at the center of the upper surface sooner than at any other point: while if applied at the bottom only, it will sour at the same time across the entire surface; and in either case, if the weather is warm, much sooner at those points than at the bottom of the mass; which practical fact, of course, demonstrates the incorrectness of the theory upon which they are constructed.

Theoretically, we should place the ice upon the surface of the milk if we would secure a uniform temperature. Practically, we cannot successfully do this; but we can reach nearly the same result by placing our milk in vessels of small diameter, immersing them in water, and placing ice on the surface of the water. This brings us to the consideration of the so-called Pail system.

PAIL SYSTEM.

By this, we secure all the advantages of the pan system, with less of its defects. We can mass our milk more perfectly, afford it better protection, diminish the extent of surface to be skimmed, avoid the use of tubes or spouts for the disposal of the sour milk; and what is more important than all these advantages, secure a more uniform temperature. In addition to the advantage of surface application of the ice, we can easily remedy any want of uniformity of temperature in warm weather, by the occasional agitation of the water; while the milk in the pans should not be agitated. The superior facilities which this system affords for the control of temperature, should alone commend its adoption to all intelligent butter makers. This discussion of the comparative merits of the different methods of raising cream, involves the question of the practicability of

DEEP SETTING.

Circumstances have not yet favored the general adoption of this principle, in any form. The large number interested in the manufacture of patent pans and in their patents, and the large amount of capital involved, has very naturally led to a thorough and animated canvassing of the country by interested parties and their agents; while I am not aware that any such influence has favored the adoption of the pail system. Such circumstances are not calculated to favor a candid investigation and an impartial decision of the matter by the public. But my opinion is, that the theory of deep setting is well founded, and has superior merits. This opinion is based upon a thorough investigation of the subject, not only by repeated experimental tests, but by a practical application of the pail system for the last five years.

What!—says an objector—my mother and grandmother always told me that milk should be set very shallow, especially in warm weather; and do you presume to dispute such excellent authority? Not at all, sir. Your mother and grandmother were right, judging from their standpoint. If we use the air as a medium for tempering our milk, we must expose it to that medium. This is practical common sense; but the folly is found in the use of such a medium, which was not their fault. But we must admit that our mothers made much better butter in June and October than in hot or cold weather. By the pail system we are enabled to submit our milk and cream to June and October conditions at all seasons, and with the same quality of milk, to secure June and October results at all times. The fundamental principle upon which the system is based is this: *that the same quality of milk submitted to the same conditions of temperature, &c., will always produce the same results.* By the pail system, we get *no more* and *no less* than by the use of the small pans, when the temperature of the air chances to range from 60° to 65°, but *more* when above or below that range, and a better quality at all times. I submit these propositions for your consideration, and ask for a thorough investigation of the subject. It is time that this question should be definitely settled. If the old practice is the best, the world should know the fact. If new systems are to be adopted, we should be prepared to act intelligently in our choice. It is a question of fact and not of theory. Let the facts be established.

Skimming.

The time required for the cream to rise, depends upon the temperature maintained. It should be skimmed as soon as acidity is developed in the milk, which should be in about forty-eight hours. At a temperature of 65° the cream nearly all rises in twenty-four hours; but as time is required to mature the cream, I see no harm in its remaining upon the milk while sweet, when but a small surface is exposed. After it is removed it should be kept at a temperature ranging from 60° to 65°, which is the range required in milk for the successful raising of the cream. This is necessary that the cream may undergo the chemical change required to facilitate a perfect separation of the casein which the cream contains. The philosophy of this change I believe to be that casein, while sweet, is attached to the butter globules by attraction; when acidity is developed, water is precipitated and the attraction ceases, and the casein is readily removed by agitation. My reason for the supposition is, that such a change as the one described is known to take place in the casein remaining after the rise of the cream, and I see no reason why the same result should not follow in that which is found in the cream. The butter produced from sweet cream is deficient in keeping qualities because of the too firm adhesion, in a sweet state, of the particles of casein to the butter globules to admit of a perfect separation.

CHURNING.

Churning is, theoretically, a very simple operation. The object sought in this is, a perfect separation of the butter globules from the other constituents of the cream; and to accomplish this most effectually, the cream should be reduced to a temperature of 60°. In very warm weather it may be two degrees colder, and in cold weather two or three degrees warmer, than this. In churning, uniform agitation is all that is required. It should not be too rapid, and be unattended by pressure, except that of its own weight, as these tendto induce a salvy, oily quality of butter. No churn should be tolerated which will allow any part of the mass of cream to remain stationary while the rest is in motion. If a part becomes attached to the top or sides of the churn, and remains stationary, even for a short time during the process, the separation will not be uniform and complete, and waste must result. And this is not all; the imperfectly separated cream may become mechanically mixed with the butter and spoil its keeping qualities.

WASHING.

The final step in the process of separation, is the application of cold water, for the purpose of removing the small amount of butter-milk remaining. When separation commences, the butter globules collect into small and nearly uniform lumps. These increase in size as the separation progresses. When about an inch in diameter, the agitation should cease, and the butter-milk be removed. Cold water should then be applied, and the mass agitated, only sufficiently to thoroughly rinse the butter. The object of stopping agitation at this point, is that the water may thoroughly penetrate the whole, and effect a more perfect separation than when massed into large lumps. This water should then be removed, a larger amount added, and the agitation again resumed. When this water is removed, if the temperature, and all the details in the process of manufacture have been properly attended to, the separation should be perfect, and we should have only pure butter remaining in the churn.

I have dwelt somewhat minutely upon the details in the process of rinsing, because I consider it a very important point. Few substances will decompose more readily than butter-milk, and if any is allowed to remain in the butter it will soon manifest its presence, and tendency to decomposition, by the taint it will produce. It is the fruitful source of rancidity, and the smallest amount will soon spoil the flavor of otherwise excellent butter.

SALTING.

The amount of salt to be added is a matter of taste. We should first learn how much salt the consumers of our butter require; adopt a method which will enable us to place in the butter just that amount; distribute it evenly, and retain it all there. In all butter designed for a given market, absolute uniformity in this particular, should be sought. We can accomplish this most effectually by the application of fine, well sifted salt, working properly, and packing, or balling it immediately before the salt dissolves. It will thus remain where it is wanted, in the form of pure brine, and perform its office.

WORKING.

The working should be uniform, which may easily be accomplished by the use of a properly constructed butter-worker. The object sought is to force out the water which may remain after removal from the churn, and thoroughly incorporate the salt, and should only be sufficient to accomplish this result. More than this will injure the grain, and impart a salvy, oily appearance.

CHARACTERISTICS DESIRED.

The characteristics desired in butter, are a good grain, a rich golden color, and a nutty, pleasant flavor. All of these can only be secured by careful attention to all the details to which I have alluded. Hence the importance of systematic effort. When we have once obtained the desired result, we have only to repeat the process, to secure like results again; and continued success depends upon the perfection of the repetition.

TEST OF SUCCESS.

The best test of our success, aside from that of actual use, is found in the purity of the brine which the butter contains. Brine of a milky appearance is never found in butter possessing the characteristics named; or, if so, these will soon be changed by its ruinous effect. If the brine is not clear, and pure, the butter, if not immediately used, will spoil, and the operator should pronounce his work a failure, ascertain and remove the cause.

STORING.

If the butter is to be stored, the tubs or firkins used should be thoroughly saturated with salt. To accomplish this, they should be soaked with strong brine for at least a week before being used. The woody, resinous taste, will thus be removed;

they will be rendered more impervious to the air, and it will also prevent the absorption of the brine from the butter; the consequent swelling of the tub after being filled, and the admission of air into the space around the butter, caused by the enlargement of the tub. Partially dissolved salt should then be spread over the surface to the depth of half an inch, which will soon form an incrustation, and effectually exclude the air.

Marketing.

The production of a superior article, and the possession of a consequently good reputation for his product, should be the objects sought by the producer; not only because of their pecuniary results, but also because of the increased pleasure which he will derive from the pursuit of his business. The dairyman who cannot feel an honest pride in his calling, should abandon it and seek one more congenial to his tastes. A good reputation in any business can only be secured by diligent interested application. Stolid indifference is ruinous to success. The butter maker, like other manufacturers, should build up a reputation. His name, stamped upon his packages, should be regarded by purchasers as a sufficient guarantee of the perfection of their contents; a trade mark of great pecuniary value to be carefully guarded, that its value may not depreciate. He should sell, when he can consistently do so, directly to the consumer, and a mutual confidence should be established, that cannot fail to result in mutual benefit.

Conclusion.

Let me say in conclusion, that whatever we do, let us strive to do it well. The mental and physical exertion which we put forth, in our business, reacts upon ourselves, and tends to ensure our success as men, and citizens. Let no one despise an honest calling which he has chosen, but rather despise himself, if he fails to prosecute it with intelligence and vigor. True manly honor is not measured by the kind of occupation which we pursue, but by the manner of its pursuit.

> "Honor and fame from no condition rise,
> Act well thy part: there all the honor lies."—Pope.

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